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Psychological Bulletin

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HOWARD C. WARREN, Princeton University (*Review*)
JOHN B. WATSON, Johns Hopkins University (*J. of Exp. Psych.*)
JAMES R. ANGELL, 522 Fifth Avenue, New York (*Monographs*) and
MADISON BENTLEY, University of Illinois (*Index*)

WITH THE CO-OPERATION OF

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THE

PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, CAMBRIDGE, MASSACHUSETTS DECEMBER 29, 30, 31, 1919

REPORT OF THE RETIRING SECRETARY, H. S. LANGFELD, HARVARD UNIVERSITY

The American Psychological Association held its twenty-eighth annual meeting at Harvard University on Monday, Tuesday and Wednesday, December 29, 30 and 31. The sessions were in the rooms of Emerson Hall and were attended by a very large number. One hundred and fourteen names were registered while many more participated in the various meetings. Fifty-seven papers were read. An analysis reveals among the papers six on theoretical problems, sixteen on experimental work, nine on intelligence tests, seven on clinical psychology, two on animal psychology, six on educational psychology, two on social psychology, six on applied psychology and three on matters of general interest to psychologists and anthropologists.

The Monday morning session was devoted entirely to General Psychology. In the afternoon there was a session upon Experimental Psychology, which was paralleled with one on Intelligence Tests. In the evening there was a reception at the home of the Secretary.

Tuesday morning there was a joint meeting of the American Association of Clinical Psychologists and at the same time a session for Experimental Psychology. In the afternoon there was a joint session with the American Anthropological Association. J. R. Angell, chairman of the National Research Council, was to have described the aims of this organization. As he was ill, his paper

was read by the President, W. D. Scott. W. V. Bingham read a paper upon the *Aims and Problems of the Division of Anthropology and Psychology*, and Clark Wissler described the manner in which the anthropologists and psychologists should coöperate. The annual business meeting was held at four o'clock in Emerson Hall. The banquet was given at the Harvard Union and was followed by a smoker. The retiring President, Walter Dill Scott, read his presidential address after the dinner.

On Wednesday morning there were parallel sessions, one on Educational and Comparative Psychology, and the other on Social and Applied Psychology. In the afternoon some of the members visited the McLean Hospital, the Psychopathic Hospital, the Nutrition Laboratory and the Judge Baker Foundation.

The Apparatus Exhibition was held in the Psychological Laboratory. Apart from the exhibit of the C. H. Stoelting Company of Chicago, the following were exhibited by members of the Association: Pictures of Psychologists by E. A. Kirkpatrick, Fitchburg State Normal School; Group Tests by W. V. Bingham, Carnegie Institute of Technology; Test Blanks and Charts by S. L. Pressey, University of Indiana; Reed I. Q. Slide Rule and Kohs Age-Finding Card by S. C. Kohs, Reed College; Tunable Bars for Pitch Discrimination by P. Young, University of Minnesota; Filters and Wedges by Prentice Reeves, Eastman Kodak Company; New Maze Apparatus by W. R. Miles, Carnegie Nutrition Laboratory; Motor Coördination Tests by F. A. C. Perrin, University of Texas; Class-Room Tachistoscope, Continuous Choice Apparatus, Apparatus for Paired Comparison of Transmission Colors, Self-Registering Tambour, Automatic Apparatus for Constant Stimuli Experiments, Device for Varying Brightness Independent of Color, by the Harvard Psychological Laboratory.

Transactions at the Annual Business Meeting

The Annual Business Meeting was held on December 29, in Emerson Hall.

It was voted that the minutes of the previous meeting be accepted as printed.

The following items of business, reported by the Council, were then acted upon:

1. The Secretary reported the deaths of the following members of the Association during the past year: Edward Cowles, August Hoch, and John Wallace Baird.

2. The Treasurer's report as printed below was read and accepted. The following budget, prepared by the Council, was also read and adopted:

ESTIMATE OF RESOURCES		
On deposit	$128.10	
Dues (approximate)	775.00	
Interest (approximate)	50.00	
Sale of Monographs	?	
Withdrawal from principal funds	50.00	$1003.10
ESTIMATE OF EXPENDITURES		
Printing and supplies	$325.00	
Postage	125.00	
Reprints	100.00	
Abstracts	50.00	
Incidentals of meeting	50.00	
Apparatus Exhibition	25.00	
Election committee	70.00	
Secretary's stipend	250.00	
Other committees	?	995.00

3. It was voted to authorize the Secretary to withdraw $50 from the principal funds of the Association.

4. The members of the Program Committee for the ensuing year were announced as follows: Messrs. Fernberger, Langfeld and the Secretary.

5. It was voted to hold the next annual meeting in affiliation with A. A. A. S., at Chicago, December 28, 29, 30, 1920.

6. It was voted to appoint W. D. Scott as representative on the Council of the A. A. A. S. for 1920.

7. It was voted to appoint Harvey Carr as local member of the Executive Committee.

8. It was voted to authorize the Secretary to withdraw an amount not to exceed $150 from the principal funds of the Association, to defray the expenses of the Committee on the Academic Status of Psychology.

9. It was voted that the Council nominate double the number of candidates for vacancies on the Committee on Anthropology and Psychology of the National Research Council and that these names be included on the ballot for officers.

10. It was voted that the two candidates recommended by the Council—Messrs. Warren and Watson—should be nominated to serve on the Division of Anthropology and Psychology of the National Research Council from July 1, 1920.

11. The Secretary reported the following nominations for membership in the Association and was instructed to cast the ballot of the Association for their election: Floyd Henry Allport, Ph.D., Instructor in Psychology, Harvard University; Thomas William Brockbank, Ph.D., Instructor in Psychology, The Catholic University of America; Mabel Ennsworth Goudge-Crane, Ph.D., Assistant Professor of Psychology, Ohio State University; John Edgar Coover, Ph.D., Assistant Professor of Psychology, Stanford, Jr., University; Thomas Russell Garth, Ph.D., Adjunct Professor in Psychology, University of Texas; Arnold L. Gesell, Ph.D., M.D., Professor of Education, Yale University, Josephine Mixer Gleason, Ph.D., Instructor in Psychology, Vassar College; Charles Hughes Griffitts, A.M., Ph.D., Instructor in Psychology, University of Michigan; Samuel B. Heckman, Ph.D., Assistant Professor of Education, College of the City of New York; Clark L. Hull, Ph.D., Instructor in Psychology, University of Wisconsin; Schacne Isaacs, A.B., A.M., Assistant Psychologist, Medical Research Laboratory, Air Service, U. S. Army; Jacob Robert Kantor, Ph.D., Instructor in Psychology, University of Chicago; Paul Kruse, Ph.D., Assistant Professor of Educational Psychology, Cornell University; Conrad Lund Kjerstad, Ph.D., Instructor in Psychology, State Normal School, Valley City, N. D.; John Norbert Melville, Special Secretary, Public Charities Association of Philadelphia; Katherine Murdock, Ph.D., Lecturer on Psychology, School of Philanthropy, New York City; Franklin Cressey Paschal, Ph.D., Assistant Professor of Psychology, University of Arizona; Edward Stevens Robinson, A.B., A.M., Instructor in Psychology, Yale University; Agnes Low Rogers, Ph.D., Professor of Education, Goucher College; Curt Rosenow, Ph.D., Psychologist, Juvenile Psychopathic Institute, Chicago; Georgiana Ida Strickland, Ph.D., Assistant in Psychology, Barnard College; Augustus Trettien, Ph.D., Professor of Psychology, Toledo University; Rutledge Thornton Wiltbank, Ph.D., Assistant Professor of Psychology, University of Chicago; Joseph Usury Yarbrough, M.A., Instructor in Psychology, University of Texas; Herman H. Young, Ph.D., Director, Child Direction Department, Child's Service Bureau, Youngstown, Ohio; Paul Thomas Young, Ph.D., Instructor in Psychology, University of Minnesota; Marvin J. Van Wagenan, A.M., Ph.D., Assistant Professor of Educational Psychology, University of Minnesota.

12. It was voted to elect Edwin G. Boring as Secretary of the Association for three years from January 1st, 1920.

13. It was voted to amend the Constitution, raising the annual dues from $1 to $2.

14. It was voted to deposit one copy of the Proceedings of the Association from 1892 to 1917 in Robbins Library at Harvard University, one copy in the Congressional Library, and one copy in the keeping of the Secretary.

The Chairman then called for the reports of Committees. Mr. Dodge, representing Mr. Yerkes, chairman of the Committee on Election of Officers, reported the results of the ballot of the Association to be as follows; for President, Professor Shepherd Ivory Franz, of the Government Hospital for the Insane; for members of the Council, elected for three years to succeed Messrs. Bingham and Hollingworth, Messrs. Langfeld and Yoakum.

Mr. Woodworth had nothing to report concerning the work of the Committee on Standardization of Mental Measurements and Tests. It was voted that the Committee be discharged.

Mr. Baldwin distributed a printed report on the Academic Status of Psychology which it was voted to accept. It was also voted that the Committee be discharged.

Mr. W. F. Dearborn made a brief report for the Committee on Teaching Experiments. It was voted that the report be received and the Committee discharged.

Mr. Warren reported progress for the Committee on Terminology. It was voted that the Committee be continued.

Mr. Geissler made a brief report for the Committee on Publications in Applied Psychology. It was voted that the report be received and the Committee be discharged.

Mr. Baldwin made a report for the Committee which had been called to confer with a committee from the American Association of Clinical Psychologists. It was moved to adopt the report which recommended the establishment of a section for Clinical Psychology of the Association.

The Secretary introduced the report of the Committee on Qualifications for Psychological Examiners and other Psychological Experts. After much discussion it was voted that the Committee be discharged and that a Committee of five members be appointed to consider methods of procedure for certifying Consulting Psychologists. It was also voted that the Council provide for mimeographing the full report of Mr. Haggerty's Committee, to be distributed among the members. It was further voted that the Committee be instructed to take cognizance of legislative attempts

to give legal status to psychologists and that it provisionally adopt the Wisconsin standard.

It was voted to authorize the President to appoint a committee of two members to coöperate with the Division of Anthropology and and Psychology for the purpose of arranging for an Abstract Journal in Psychology of international character.

New Business: Mr. Ogden moved to express the thanks of the members to the Secretary and to Harvard University for the kind hospitality shown. The motion was carried by a rising vote.

The meeting then adjourned.

Report of the Treasurer for the Year 1919

Dr.

To balance from the previous year	$1808.56	
Dues received from members	386.25	
Interest from July 1, 1918, to July 1, 1919	59.53	
Sale of Monographs, Nos. 51 and 53, year ending December 31, 1918	4.32	$2258.66

Cr.

By Printing and Supplies	$ 212.53	
Postage	46.52	
Expressage	6.77	
Reprints of proceedings	26.38	
Reprints of Nat'l Research Council report	44.61	
Incidental Expenses 1918 meeting	44.20	
Secretary's stipend	250.00	
Exchange on cheques	1.40	
Council's expense to extra meeting	6.55	
Expense, election committee	65.38	
Dues undeposited	3.00	$707.34
Balance in Fifth Avenue Bank	$ 118.71	
Balance in Union Dime Savings Bank	1432.61	$1551.32
		$2258.66

Cambridge, Massachusetts,
December 27, 1919

Herbert S. Langfeld,
Treasurer

Audited by the Council.

TITLES AND ABSTRACTS OF PAPERS

Changes in some of our Conceptions and Practises of Personnel. (Presidential Address.) WALTER DILL SCOTT, Northwestern University.

GENERAL AND EXPERIMENTAL PSYCHOLOGY

On the Use of the Gaussian Law in Mental Measurement. E. G. BORING, Clark University.

The normal law of error is frequently, either explicitly or implicitly, assumed in the statistics of mental measurement. Any form of distribution depends, however, upon the scale of units against which it is plotted; and, unfortunately, the assumption of the normal law is usually made without a critical examination into the nature of the unit of measurement. If the normal law is the law of chance, then it is evident that two mutually dependent variables, for which the relationship is not simply linear, can not have the same form of chance distribution; if the distribution for one is normal, then the distribution for the other can not possibly be normal.

It appears that the extensive use of the normal law in mental measurement comes as a result of an uncritical application of the generalities of games of chance to the psychophysical organism. Logically we may not assume the normal law except, as is the case for games of chance, in a definite knowledge of the nature of the unit. Almost always in mental measurement, however, we have no unit but simply a scale of rank-orders in which our data are placed. Moreover, because of the dependence of the form of distribution upon the unit, we can not, in the present state of psychological information, hope to arrive at a general conclusion that the Gaussian function applies to any entire class of mental data.

Relaxation. G. V. N. DEARBORN, Sargent Normal School.

Numerous experiments show that serviceable "relaxation" is best brought about by lowering the tension of the attention; *directly*, by "making the mind a blank" (lapsus), and *indirectly*, by assuming an unexciting euphoric tone, a kind of hygienic Nirvana.

Demonstration of hemobarograms. Deliberate general relaxation seems to show two types of reagents. One type, a small minority, does lower the brachial arteriotension by muscular relaxation; the other type does not, but raises it or throws it into unusual variation, or both. Both classes usually exhibit an initial effort-rise. The neural class-difference is unknown, but probably it is not largely a matter of direct voluntary control, for a professional expert in this respect (Neudorf) showed on relaxation a blood-pressure rise. Restful relaxation, then, has to be mentally coaxed and seldom can be physically driven. It seems not improper to suppose that the nerves directly inhibitory to the contraction of voluntary muscle (Nicolaides, Dontas, Wooley, Froelich), are stimulated from the upper cortex cerebri, in some way related to a change in the conscious kinesthesia, as an indescribable sagging sensation in the musculature. This may or may not be part of a hurryless and worryless euphoria acting through the autonomic and the vagus.

Are There Any Instincts? K. DUNLAP, Johns Hopkins University.

In general psychology the term "an instinct" is used in a rather loose way to indicate various combinations of unlearned activities which it is useful to consider together. What one psychologist designates as a *reflex*, another may classify as an *instinct.* Some restrict the term to unconscious activities; some to non-volitional activities; some exclude neither consciousness nor volition. Usually the term is applied without restriction both to activities considered as a group from the physiological point of view, and to activities teleologically grouped. This looseness is perhaps not detrimental, from the point of view of general psychology: but is productive of confusion in social psychology.

In social psychology (taking MacDougal as an illustration) the tendency is to classify "instincts" *teleologically*, ignoring the physiological groupings. Thus, the "reproductive instinct" includes any and all activities of a certain grade which are concerned with the propagation of the species: the "pugnacious instinct" includes all those activities which contribute to or eventuate in combat. This procedure is by no means harmless, as it substitutes definitely the teleological for the psychological point of view. The practical result is that the social psychologist stacks his cards in giving his list of "instincts," and his further analyses are productive only of the conclusions he assumes at the start. Given a different list of "instincts," a different social psychology results.

There are endless possible classifications of "instincts" to which no objection can be made if it is understood that they are constructed for purposes of convenience only. One may perfectly well assume that there is a "moral instinct," if it be admitted that there are results in the world which can be classified as "moral." If one does not wish to consider these results in a group by themselves, then there is, for him, no "moral instinct."

The activities included under several different "instincts" may be identical. Certain "instincts" may include all the activities of the animal. Some "instincts" are merely modifications or expression of others. This is not an objection for teleological classification, but indicates that the classification is not psychological.

It is suggested that we cease to speak of "instincts," since these do not occur in a psychological sense: and that we use the term "*instinctive activities*," restricting it to the meaning it now has in contrast with "instincts."

A Behavioristic Interpretation of Concepts. R. C. GIVLER, Tufts College.

Concepts are written or spoken words which point to classes or to the relations between objects, and whose *meaning* is the motor attitude, attunement, or set which the sight or the sound of the word arouses in us.

We distinguish between the origin and development of concepts and their everyday use, but lay special emphasis upon the latter. Particularly is it to be noted that the same concept (word) may have practically the same meaning whether it be in the focus or the fringe of the "thought." This is because the function of all concepts is an instrumental function, *i.e.*, the attitudes they stimulate are all neuro-muscular-tension attitudes which normally eventuate in some overt action. The neuro-muscular mechanism involved in the building up of these attitudes, while still wanting in some of its details, is nevertheless predicatable in the main from what we know of the mechanics of nerve and muscle.

Certain implications of this theory in pedagogy, ethics, logic, and religion are obvious. The service which all concepts properly render is, from the biological point of view, the building up of motor attitudes (potential energy) which can go over into overt action (kinetic energy, or work.) The relative value of concepts may also be criticized on these grounds.

The Conditioned Reflex and the Freudian Wish. G. HUMPHREY, Harvard University.

The process of building up the wish as Freud understood the term is a complicated one, *e.g.*, to the desire for food, once satisfied by food alone, must be added numerous frillings in the case of the epicure. Why are these accessories necessary? Because, they have become "associated" with food. In other words, the wish I have for a meal consists of the hunger drive put into operation by the mechanism of the conditioned reflex, simultaneity, as Aristotle observed, being the essential factor in this substitution of one stimulus for another. Restated in terms of the conditioned reflex, the wish becomes then a course of action for which the organism is set (Holt) by means of a system of conditioned reflexes. Such a system requires a very complex nexus of stimuli. If some of these are missing, some of the reflexes will be excited and others left unexcited. A stress is set up, and it is then that we say that we have a wish in the non-Freudian sense of the term. This partial excitation is at the bottom of most of the pathological cases, and it explains many instances of "conflict." In "conflict" the hindrance to complete excitation is internal, consisting of previously acquired inhibitory reflexes. The discomfort comes not from the opposition of the two reflexes but from the fact that one of them is partially excited. There is no evidence that mere inhibition causes discomfort, but there is evidence that stress is caused by partial excitation of a system, and indeed the word "tantalize" expresses exactly this pure partial excitation. Whenever we have inhibition causing a conflict, there is always partial excitation. Introspection gives the cause of the unpleasant feeling as the fact of the inhibition, but this is only "rationalization." The stress is internal to one of the systems, not external to both.

Thus systems of interconnected conditioned reflexes are set up, the reaction to the combined stimuli of which constitutes the Freudian wish. The constituent reflexes come to condition each other as well as the joint reaction, and so, when some of them are excited and others not, the whole mass is thrown into a condition of stress. Hence the wish as the ordinary man understands it, which is a mild form of conflict.

The Tonal Manifold; with a Note on the Attribute of Brightness. R. M. OGDEN, Cornell University.

The paper describes a graphic representation of the tonal series

as it varies from the lowest to the highest audible tones. Each tone is pictured as having a certain volumic spread on the base line of the chart, thence rising to a peak which indicates its pitch-brightness. The height of the peak above the base line is measured by Wien's curve of inherent intensity, which denotes relative sensitivity for different degrees of vibrational frequency.

Within the musical range of tones volume decreases regularly with increase of vibrational frequency, while the variation of inherent intensity indicates our ability to discriminate pitch-brightness with approximately equal increments of vibration.

With the lowest tones the volumic spread is exaggerated and the pitch-salients are displaced from the center of the mass to indicate the fact that low tones sound higher than they should. With the highest tones, on the contrary, the volumic spread is progressively less than it should be and the pitch-salients are displaced in the opposite direction, indicating the tendency to judge high tones as flat and finally as lacking true tonal value.

The possibility of brightness as an independent variable is also discussed and further investigation of the transition from tone to vocable, by adding vibrational components which vary but slightly in frequency, is advocated. The indications are that the characteristic of a vocable rests upon a compound of closely graded components whose resultant sound, within limits, need not vary in pitch, intensity, or volume, but would manifestly vary in brightness, since the saliency of the pitch would be reduced or rounded off by the combined effect of closely graded vibrational frequencies.

Plethysmographic Studies of Physical and Mental Work. J. E. ANDERSON, Yale University.

Circulatory reactions in the arm were studied during periods of physical and mental work by means of a Lehmann arm plethysmograph connected with a piston recorder.

1. With subjects introspectively in good physical condition a one-minute test period of physical work (with the foot ergograph) was accompanied by a vaso-dilatation in 74 per cent. of the cases: with subjects in poor condition such a dilatation occurred in 47 per cent. of the cases.

2. The effect of a long fatiguing period of physical work was shown in an increased tendency to vaso-constriction in subsequent one-minute test periods. Similarly the later periods of mental work (during an hour of experimentation upon mental work) exhibited an increased tendency toward vaso-constriction.

3. A high percentage (approximately 75 per cent.) of all the records taken during mental work showed vaso-dilatations. There was some variation in the percentage of dilatations corresponding to each type of work. On one group of subjects the results were as follows: simple counting 65 per cent., reading 73 per cent., translating 75 per cent., continuous addition 77 per cent., memorizing poetry 80 per cent. and physical work 83 per cent.

4. Other results suggest a relationship between the difficulty of the mental work and the consistency of circulatory reaction during a five-minute period of work, *i.e.*, the persistence of a vaso-dilatation or a vaso-constriction without change throughout the period. Reading a newspaper article was accompanied by such a persistence of reaction in 11 per cent. of the cases, continuous addition in 40 per cent. and memorizing poetry in 60 per cent.

5. If the first period of work (physical or mental) is productive of a decided volume change (either a vaso-dilatation or a vaso-constriction) it is likely that all subsequent periods on the same day will show the same volume change.

6. The character of the volume change tends to be constant for any given individual: some subjects consistently gave vaso-dilatations, others consistently gave vaso-constrictions and still others equal percentages of vaso-dilatations and vaso-constrictions.

7. No correlation appeared between feeling tone and the direction of the volume change, *i.e.*, the percentages of vaso-dilatations for pleasant, unpleasant, and indifferent mental work are the same.

The Momentary Character of Ordinary Visual Stimuli. P. W. COBB, Medical Research Laboratory.

Measurements of the visual threshold, made under conditions devised to represent extreme types of distribution of light met in practice, have not shown changes in visual sensitivity at all comparable with the changes expected from the testimony of those who have had to use the eyes under the practical lighting systems so typified. In the measurements the writer has in mind, the threshold was measured as the least difference in brightness between the two halves of a field, with an exposure-time of three seconds.

It would appear that the defect in the method consisted in the fact that in the ordinary use of the eyes stimulation is momentary and never prolonged. Aside from experimental situations such as just mentioned the eyes are only by way of exception

ever fixated or stationary in any state of attentiveness to visual stimuli. Researches upon the eye-movements executed in reading, for example, have shown that the fixational pauses are momentary. Further, in ordinary use, the stimulus is never of such diminutive spatial or photometric magnitude as is adequate for leisurely observation.

For the experimentalist the situation is helped by looking upon the retina as a physico-chemical reactor, undergoing continual change in the course of ordinary activity; and tending, under constant stimulation, toward a corresponding end-state at a rate greater the greater the remoteness of that end-state. Such an end-state is theoretically never reached, and is practically not even approximated. The result of threshold measurements made with prolonged fixation is an appraisal of sensitivity with respect to the end-state, while the result of threshold measurements made with momentary stimulation may be expected to be a measure of the lability of the retina under the conditions involved. This latter would seem to be a better representative of the sensitivity of the retina as a practical consideration.

Speculatively, undue fatigue of the eyes under a bad distribution of light might be explained by the hypothesis that the wonted fixational pauses of the individual have become relatively inadequate owing to a slowing of the retinal response and that the efforts at readjustment of the rhythm are irritating and fatiguing. There is a parallel in the effort required to adjust one's locomotor movements to a step much different in length or frequency from his own.

Intra-serial Expectation in the Method of Constant Stimuli. S. W. FERNBERGER, Clark University.

The present experiment was devised to discover if the order of the presentation of the series of stimuli in the method of constant stimuli has any effect upon the formation of the judgments. One might expect any of three possible results: 1, no effect; 2, physiological expectation, which would be bound up with the absolute impression of the stimuli, or 3, psychological expectation, bound up with the tendency of observers to reverse a preceding judgment.

We employed lifted weights as our stimuli with the usual three categories of judgment. We so arranged our experiment that two complete series of stimuli were mixed, and so the judgments for these two series were taken under similar conditions. In the first

series, our central stimuli (96 and 100 grams) immediately followed our heaviest stimuli (104 grams). In the second series, our central stimuli (96 and 100 grams) immediately followed our lightest stimuli (88 grams).

We found a marked and invariable psychological expectation—evident in a strong tendency toward reversal of the former judgment—for all of our four subjects. There was a marked tendency to judge the critical stimuli (96 and 100 grams) lighter when they immediately followed the 104 gram weights; and to judge them heavier when they immediately followed the 88 gram weights. This is evidenced by a rise in the point of subjective equality for the first series and a lowering of that point for the second series. The difference between these two points of subjective equality was, on the average for all of our subjects, about 2.5 grams—this value being well beyond the probable error. There was little difference in the size of the intervals of uncertainty for the two series—the average difference being well within the probable error. Progressive practice did not seem to have any marked effect on this factor of intra-serial expectation but, if anything, seemed slightly to increase its influence.

An Acuity Lantern and the Use of the Illumination Scale for the Detection of Small Errors in Refraction and Their Correction. C. E. FERREE & G. RAND, Bryn Mawr College.

This apparatus was devised in response to a request by the Eye Division of the U. S. Naval Hospital for a means of making a quick and accurate test of acuity at low illuminations. Experience has shown, roughly speaking, that only 25–30 per cent. of the men on the battle-ships have a sufficiently keen acuity of vision at low illuminations to qualify for all branches of the look-out and signal service work. The apparatus provides for a wide range of illumination in just noticeably different steps (beginning at 0.07 meter-candle or lower), with no change in the color value of the light and with a specification at each step of the intensity of light falling on the test-object.

The apparatus has the following laboratory and clinic uses. (1) Photopic acuity may be tested under the conditions of a constant and uniform illumination of known intensity. In case the test-object is a line or chart of letters, provision is made that each letter receives equal amounts of light. (2) Scotopic or twilight vision may be tested—also the amount and rate of scotopic adaptation.

A precise and feasible means is thus afforded for testing the light sense insofar as it affects the power to see clearly. (3) The light sense may be tested directly in terms of the amount of light required to arouse just noticeable sensation. And (4) by making it possible to determine with great exactness the minimum illumination at which the test-object can just be discriminated, the apparatus provides a very sensitive means for detecting small errors in refraction and in their correction.

Insofar as the test-object is concerned, clearness of seeing depends upon the value of the visual angle subtended and the intensity of the illumination. It follows from this that either the illumination scale or the visual angle scale may be used for the detection of errors in refraction, *i.e.*, in the diagnostic procedure either the illumination may be held constant and the visual angle varied or the converse. Since the visual angle scale sustains a 1:1 relation to the acuity scale while acuity changes slowly with change of illumination, the illumination scale possesses the greater sensitivity for the detection of small errors in refraction—also greater ease and feasibility of contrivance and manipulation. Used in this way the illumination scale serves in effect as an amplified scale and has an advantage in sensitivity in proportion to the amplification. In clinic practice it has already been shown to be of great value in determining the exact amount and placement of the correction of astigmatisms.

The Influence of Expectation on Supraliminal Discrimination. L. R. Geissler, Clark University.

Several years ago the writer published results of experiments measuring the influence of expectation on the accuracy of sound-localization. In the present report the work was extended to judgments of supra-liminal differences of sound intensities and of visual extents. The difference limen for a soft and a loud standard sound intensity and for a short and a long standard visual extent (of 15 and 30 cm.) was determined for each observer in preliminary trials which served also the purpose of familiarizing him with the standards. In the main series twelve variable stimuli of each kind were used, three of which were smaller than the low standard, four greater than the low, but smaller than the high standard, three greater than the high standard, and two were equal to the standards. Each standard was compared equally often with each of the variables under the following three conditions: (*a*) Either standard was

given and the observer instructed to expect a variable similar to to it in intensity or extent; (*b*) the standard was not actually given but merely announced and the observer instructed to expect a variable like it, as vividly as possible; (*c*) the variables were given without previous mention of a standard and the observer instructed to compare their intensity or length with his memory images of either of the two standards. The judgments were expressed on the basis of prearranged scales.

In order to control in an objective or behavioristic way the expectant attitude, a "conditioned habit" (analogous to a "conditioned reflex") was set up during the sound-experiments by the use of the involuntary arm-tremors recorded by the Titchener automatograph. In the visual experiments the behavioristic control was attempted by placing the hands during the expectation-period at distances apart equal to either standard expected.

The influence of expectation manifests itself in general thus: the intensity or extent of a variable stimulus is the more over- or underestimated, the more it differs from the previously expected standard; the tendencies to err are always in the direction of the expected standard and thus lead to a decrease of the interval between the two stimuli compared. The error tendency is larger when the standards to be expected are also previously given in perception than when they are merely imaginally anticipated. The probable explanation of these phenomena lies presumably in the definite muscular set involved in the expectant attitude, which interferes with the proper neuro-muscular readiness to receive the new stimulus.

Psychological Effects of Deprivation of Oxygen as Indicated by a New Substitution-Test. H. M. JOHNSON & F. C. PASCHAL, Air Service Medical Research Laboratory.

The following work was begun with two purposes in view: (1) To indicate, independently of the experimenter's personal judgment, the extent and rate of deterioration of behavior under a diminishing supply of oxygen; and (2) to ascertain whether the higher processes tend to deteriorate before, after or simultaneously with, the simpler processes. The experiment failed of the first objective but contributed somewhat toward the attainment of the second.

Thirty highly selected subjects were successfully used, all but three being aviators whose training had been completed and who

were awaiting discharge at the port of debarkation. A considerable number had been engaged in combat service in the A. E. F.

Deprivation of oxygen was accomplished by the use of the Henderson rebreathing apparatus as originally constructed, or as modified by Rogers. In the latter form, the apparatus permitted control, within reasonable limits, of the rate of diminution of the oxygen supply.

The work assigned the subject was the transliteration of a number of sets of nonsense material into different ciphers. The sets of material and also the sets of ciphers were developed with a view to uniform distribution of difficulty and the results showed that the attempt was successful. The effects of practice was stabilized by the transliteration of three to six sets, before deprivation of oxygen began. The measure of performance is the number of letters correctly enciphered per unit of time. The subject is so informed.

While large individual differences appear, there is a definite tendency toward a steady improvement from practice until a moderate degree of diminution of oxygen has been reached. At this stage a definite loss of speed or accuracy, or of both, is usually evident; but it may be followed by a marked increase in effort, which compensates partially or entirely for the impairment so far sustained. As deprivation proceeds still farther, compensation ceases to be adequate, and eventually integrated responses fail. The results of this experiment are by no means conclusive, but they suggest that responses tend to deteriorate in the order of the degree of coördination which they involve.

The Physical Measurement and Specification of Color. L. A. JONES & P. REEVES, Eastman Kodak Company.

The paper deals with the physical methods by which those properties of radiant energy which determine the resulting color are measured and specified.

The first method, analytical in nature, specifies the quality of radiation by giving the relative intensity at each wavelength throughout the visible spectrum. The results are plotted graphically and give a spectrophotometric curve. This method gives the exact physical composition of the radiation in question but provides no direct specification of the subjective factors.

In a second method, which is synthetic, the specification is made directly in terms of the three subjective factors, viz., hue, saturation and intensity. Such measurements are made by means

of a colorimeter, the action of which is based upon the fact that any color can be matched by a mixture in proper proportions of monochromatic light with white light. The hue factor is specified in terms of the "wave-length of the dominant hue," and the saturation factor in terms of "per cent. white." Intensity is measured by means of some suitable photometer which may or may not be an integral part of the colorimeter. In case of reflecting surfaces, the intensity factor is specified in terms of reflecting power, transmitting media by the total transmission and in the case of emitting sources by the intensity of the source.

A third method, partly analytical and partly synthetical, specifies a color by giving the relative intensities of some arbitrary red, green and blue which when mixed together match the unknown. Types of colorimeters and color comparators are discussed.

The paper aims to present a general outline of the subject and to emphasize the importance of a precise measurement of the various factors necessary for a complete specification of color.

A Pursuit Pendulum. W. R. MILES, Carnegie Nutrition Laboratory.

From psychological data collected on aviation candidates at the Nutrition Laboratory in 1917, it was learned that the accuracy of ocular pursuit movements in following a swinging pendulum correlated fairly well (+ .40) with the subsequent progress of the men in learning to fly. The Dodge photographic technique for recording such ocular movements appeared to certain government advisors as too complex for adoption at aviation fields. To meet this objection a very simple apparatus has been arranged which gives an immediate and quantitative score for the accuracy of the eye-hand pursuit coördination.

In this device a pendulum carrying a reservoir is arranged to swing over a sink or table, a small stream of water flowing from the lower extremity as the pendulum swings. The individual under test, seated before the sink, attempts to collect the water in a cup of limited diameter. A separate cup is used for each double swing of the pendulum and the volume of liquid collected in each cup is measured. A double swing in this particular apparatus requires 2 seconds, and 50 c.c. of liquid are expelled. The release is by the fall of a small hammer visible to the subject. The device is its own chronometer and has no electrical features. Other more complicated apparatus of a similar nature are suggested.

As a performance test the catching of the liquid challenges the interest of most subjects. Results are presented for a group of 18 adults who made 20 catches per day on 35 days. On the first day individual averages range in performance from 16 to 57 per cent. with a total average of 30 per cent. On the last day performance ranges from 62 to 90 per cent. with a total average of 75 per cent.

The Comparative Influence of Majority and Expert Opinion. H. T. MOORE, Dartmouth College.

The writer describes a group experiment in social psychology the purpose of which was to measure the influence of majority and expert opinion on affective responses. This influence was measured in terms of reversals of judgment made in agreement with the majority and with the expert. Paired comparisons dealing with linguistic, ethical and musical judgments supplied the first data. The material used was 18 pairs of instances of bad English speech, 18 pairs of ethical situations, and 18 pairs of resolutions of the dominant seventh chord, played on an organ.

At a second trial the same paired comparisons were repeated, preceded in each case by the announcement of the majority preference. A third trial was conducted similarly, this time with the announcement of expert opinion regarding each pair. Comparison of the records of the three trials showed what per cent. of chances to reverse judgment in agreement with majority or expert opinion had been accepted by each individual in the three fields of language, morals, and music.

As a check experiment another group was given the same series of comparisons on two separate occasions, and without any special influence during the second trial. This made it possible to estimate the chance factor in the reversals of the above judgments.

The results indicate that the probability of reversing judgment in matters of speech agreeable to majority opinion is 5.3 times mere chance; whereas the tendency toward reversal in agreement with the expert in this field is 4.1 times chance. Moral reversals under majority influence are 4.7 times chance; similar reversals of musical preference are only 1.9 times chance. In these last two fields majority and expert influence are almost equally effective.

Some Notes on Early Imaginative Behavior of Children. G. C. MYERS, Camp Upton.

Samples from elaborate notes on the writer's two children were

given in reference to their imaginative behavior with emphasis upon the influence of definite early experiences, and of stories read to them as early as the sixteenth month.

Analysis of these notes seem to emphasize the following: (1) That nothing can happen in the child's experience without affecting in some way his subsequent behavior. (2) That children symbolize and dramatize naturally (without being taught); (3) That symbolism is the fundamental means of childhood play and hence of childhood joy; (4) That probably the most pronounced kind of joy in childhood is the joy in awareness of creation; (5) That fairy tales and other imaginative stories, devoid of fear appeals, are indispensable to a normal happy childhood; (6) That the imaginative behavior of children reveal often their strongest wishes, as well as their most subtle motives; (7) That to appreciate any child so as best to guide his conduct, the parent, nurse, and teacher, must have a clear, detailed and comprehensive conception of the way that child's imagination works.

A Comparison of Motor Tests With Estimates of Character, Mental Test Scores, and University Grades. F. A. C. PERRIN, University of Texas.

The investigation reported in this paper had for its object the analysis of motor ability. The data upon which the analysis is based include; (1) the scores of three complex motor tests—the Bogardus Fatigue test, card sorting, and a coördination test; (2) systematic observations of the subjects during the testing; (3) the scores of fourteen tests of elementary motor functions, such as rhythm, balancing, motor memory, inhibition, aiming; (4) estimates of certain traits of character observed during the testing; furnished, however, by judges who were not witnesses of the test performances; (5) mental test scores; (6) university grades. An intensive study was made of a group of 51 adult subjects.

Among the conclusions formed may be mentioned the following: (1) Motor ability is not general, but definitely specialized. The scores of the different tests fail to show correlations; in fact, the largest coefficient of correlation obtained was negative. (2) A complex motor performance is not to be explained primarily in terms of a number of specific motor functions. While it is true that the Bogardus test involves accuracy, rhythm, and speed, the correlations between ability in this performance and in these functions are too small to justify such an assumption. (3) In addition

to these specific motor functions, a few others may be described, such as degree of ambidexterity, fine coördinations as contrasted with gross adjustments. But these cannot be established as general explanatory principles. (4) The type of intelligence measured by mental tests and by university grades fails to correlate in any significant way with any of the motor tests. But at the same time, factors best described as intelligence factors contribute primarily to superior ability in complex motor tests. These tasks must be regarded as learning reactions; and, although the intelligence elements function in these reactions, they do so largely in an unconscious manner. (5) The assumption that there are general traits of character which can be used as explanatory principles in the analysis of motor ability is justified only in part. *Poise* seems to be fairly general, and operative in motor achievement as well as in social adjustment. *Determination* is a variable and unpredictable trait. (6) Emotional factors are difficult to evaluate, but in general their effects are secondary. Blood pressure records fail to indicate emotional disturbances. Inferiority complexes not only appear during the attempts of the subjects to master difficult motor tasks, but seem to function in a variety of ways.

The Psychology of Belief. A. A. Roback, Harvard University.

The purpose of this experiment was (*a*) to discover the psychological factors inducing the attitude of belief, and (*b*) to study the effect of repetition on this attitude.

Passages from the most diverse authors covering the scholastic discourses of St. Anselm, the picturesque dogmatism of St. Thomas Aquinas, the visionary doctrines of Swedenborg, the paradoxical utterances of Nietzsche, the tenets of Christian Science, the political issues of the day, etc.—were presented anonymously for short periods to seven subjects and their introspection recorded in regard to their attitude of belief, its antecedents and sensori-motor concomitants. The schematic scale of belief judgments consisted of (*a*) *absurd*, (*b*) *credible*, (*c*) *acceptable*, (*d*) *convincing*. The demand for another class on the part of the subjects necessitated the inclusion of non-acceptability as the content of an attitude intermediate between those calling forth respectively the judgments of credibility and absurdity.

The results showed that belief depends on the *congruity of the imagery induced by the passages with the memory images of a similar situation actually experienced.* The rational element in belief has

apparently been much overestimated in the literature judging from the fact that the judgments in the vast majority of cases were induced by imagery and emotional sets. At times an absurd or non-acceptable idea couched in quaint language would be judged credible by way of compromise. The logical attitude giving way to the aesthetic appreciation of a passage is one of the most interesting results in this connection. In many cases the judgment was given before the idea of the passage was justly grasped.

Familiarity is an asset in bringing on the attitude of belief. Repetition serves to modify the original attitude in the opposite direction. Convincing passages become less so, while absurd passages take on a credible aspect. This paradoxical change is due to the shifting view-point of the subject, who interprets a literal passage figuratively and a figurative passage literally as his tendency to ward off monotony increases.

On the psychophysical side, acceptance is characterized by a tingling in the chest and feeling of well-being; rejection, on the other hand, is marked by tenseness, contraction in the throat and chest, checking of respiration and sometimes kinaesthesis in opposite directions.

Three Experiments in Retroactive Inhibition. E. S. ROBINSON, Yale University.

1. In the first experiment the test material consisted of series of four-place numbers, eight numbers to the series. The interpolated material was of five kinds: (*A*) series of four-place numbers similar to the test series, (*B*) series of consonants, (*C*) passages of descriptive poetry, (*D*) multiplication problems, (*E*) passages of simple narrative prose. (*A*), (*B*) and (*C*) were memorized; (*D*) and (*E*) were not. Recall of the test material took place immediately after the interpolated period which was constant in length however filled.

In terms of amount, accuracy and time of recall there is a decided inhibition for condition (*A*), *i.e.*, where interpolation and test activities are very similar. There is no such decisive evidence for inhibition for any of the other conditions.

2. In the second experiment the test material consisted of series of three-place numbers displayed four, six, eight, ten or twelve times. Memorizing the test material was followed by a constant interpolated period which was filled with the memorizing of a second series of numbers (always displayed eight times) or with reading, with no attempt to memorize, in a daily newspaper.

Curves were plotted showing amount, accuracy and time of recall for various degrees of learning where (1) memorizing numbers and (2) newspaper reading were interpolated. These curves show that memorizing a similar material causes retroactive inhibition as compared with reading dissimilar material. This inhibition is present for all the degrees of learning examined and is on the whole constant in absolute amount. There is some evidence, however, that, measured in absolute terms, there is less inhibition for series presented eight times than for those presented four or twelve times.

3. In the third experiment the test material consisted of three place numbers displayed eight times. The interpolated material consisted of similar series also displayed eight times. The period between memorizing the first series and its recall was twenty minutes in length. The interpolated memorizing, which took five minutes, was placed in the first, second, third or fourth five minutes following the test memorizing.

There is a pronounced inhibition caused by the interpolated memorizing and the amount of this inhibition is practically constant for all temporal positions of the interpolated memorizing. There is a slight possibility, however, of less inhibition where the interpolated memorizing occupies one of the mid periods.

Wave-Phase in the Open-Ear Localization of Sound. C. E. SEASHORE, University of Iowa.

1. Demonstration of the localization of sound by wave phase in open-air conduction.

2. Some laws of the movement of this phantom sound with reference to synchronism, distance, pitch, intensity, timbre, and direction of the two courses.

3. The empirical curve of intensity in a series of standing waves.

4. Wave phase localization interpreted in terms of intensity.

An Entoptic Phenomenon Demonstrating the Optic Impulse. L. T. TROLAND, Harvard University.

When a spot of light of appropriate area is thrown upon the retina in the general region of the yellow spot, bands of luminosity can often be seen which connect the stimulus spot with the vicinity of the blind spot. A study of the course of these bands for different shapes and locations of the stimulus spot, in comparison with the histology of the nerve fiber layer of the retina indicates that they

are due to secondary stimulation of retinal fibers by the impulses passing along other adjacent fibers. The present paper will give the results of observations on the phenomenon with fifteen spectral colors distributed at intervals of 20 $\mu\mu$ over the spectrum. Measurements of the threshold of the phenomenon with respect to intensity indicate that this is in the neighborhood of one photon, and that there is a distinct minimum in the middle of the spectrum, the curve for the effect corresponding roughly with a reciprocal of the visibility curve. The laws of adaptation and the color effects of the phenomenon will also be reported upon, and theoretical implications of the results will be developed.

The Competitive Factor in Reactions to Choice. A. P. WEISS, Ohio State University.

A short telephone buzz was the stimulus for pressing a key with the index finger of the right hand; a flash of light the stimulus for pressing another key with the second finger; for both sound and light, both keys were depressed. When the reactions exceeded 300 sigma, a flash of red light indicated to the subject that his reactions were "slow." The stimuli were presented in variable order and at variable intervals. The reactions were automatically recorded and this record indicated both speed and accuracy. The competitive factor was introduced by having each subject score his own record and also check over the scores of each of the other subjects. This scoring activity was observed and analyzed.

The experimental situation was thus made up of two factors: (1) the sound light stimuli that released the finger movements; (2) the stimuli from handling the records that released the scoring movements. Only the effects of the second, the competitive situation will be considered.

At first the handling of the records was accompanied by: energetic verbal reactions to the various scores; actual finger movements demonstrating, "How to make a good score," or "How to beat the machine"; verbal resolves to excel on the next series; prolonged discussion of the records. These reactions, which represent the competetive situation, may be regarded as *excess* movements that accompany the actual scoring activity of counting and checking. These *excess* movements retard the development of speed and accuracy in scoring, but prolong the finger reactions and increase the tonicity of those muscles that accommodate the subject better for the sound and light stimuli. As the energetic

verbal discussion and prolonged finger reactions disappeared, speed and accuracy for scoring improved, but the speed and accuracy for the finger reactions approached a level. The effect of competition in this experiment may therefore be regarded as manifesting itself in two ways; (1) by prolonging the time during which the subject reacts, both overtly and incipiently, to the stimuli that release the finger reactions; (2) by keeping the tonicity of a specific group of muscles, (finger-eye-ear accommodation) at a higher level. In other words, the competitive situation is the equivalent of additional practice.

Intelligence Tests

Some Group Tests. W. V. Bingham, Carnegie Institute of Technology.

A spiral omnibus intelligence test blank is shown which the Bureau of Personnel Research has prepared by combining in a single time-limit test the various parts of Army Alpha. Like other omnibus tests it differs from other forms of group intelligence test in demanding more rapid and repeated readjustments of mental set. It is a "*spiral* omnibus" test because of the progressively increasing difficulty of the unit task as each form of task recurs. It is convenient to administer, requiring no oral directions by the examiner. Its relative reliability as compared with Army Alpha or the Thurstone cycle-omnibus test has not yet been adequately measured.

Current editions of Thurstone's tests are exhibited, including the *cycle*-omnibus intelligence test for use with college students and high school seniors, a set of engineering ability tests, and two general clerical tests. The engineering ability tests have been used this year with ten thousand entering students in forty-seven engineering colleges. The cycle-omnibus intelligence test has been given to 24,000 entering students. It is the plan to check the performance in these tests against achievement in the college course as shown by student marks and instructor's estimates.

These test blanks are not for general circulation, but educational authorities who may be contemplating the use of mental test methods may obtain samples by correspondence with L. L. Thurstone, Carnegie Institute of Technology, Pittsburgh. It is particularly desired to obtain additional norms of seniors in Manual Training and Technical High Schools.

Intelligence Tests at Brown University. S. S. COLVIN, Brown University.

During the academic year 1918–19, two sets of psychological tests were given to all first-year men. One set, designated the Brown University Tests, was given early in the year and later the Alpha Army Tests were given. The Brown University Tests, and to a less degree the Army Tests, proved of diagnostic and of prognostic value. By means of these tests it was found possible to judge with considerable accuracy in regard to a student's mental capacity and his probable success in college work. The Brown Tests, in particular, gave a very fair indication of the student's probable scholastic attainment, the correlation (Pearson) between the results of this test and standing in college for the first two terms being .60.

At the opening of the present year, the Thorndike Comprehensive Tests were given to about 300 first-year men, and later, the Brown University Tests were given to these same students. The Thorndike Tests, as well as the Brown Tests, gave distribution conforming with great exactness to the normal frequency curve, clearly indicating that the abilities tested were satisfactorily measured. There was a close agreement between the results of the Thorndike Tests and the Brown University Tests, indicating that the two measure approximately the same kind of abilities.

The results so far obtained give reason to believe that these tests are of considerable value in determining the ability of men to do college work, and in advising them in regard to the problems connected with their study and their plans for future careers.

The Average Mental Age of Adults. E. A. DOLL, Princeton University.

The median letter-grade of army recruits proved to be low C. The Stanford Binet mental age equivalent of low C is thirteen years. Hence the median mental age of unselected adult males is thirteen years. The median mental age of negro and foreign-born recruits is found to be only ten years. One thousand adult male state prisoners examined with Alpha register a median mental age equivalent to thirteen years (allowance being made for nationality and color). Five hundred typical public school children examined with Alpha show no increase in median scores by age after thirteen years. Five hundred delinquent boys show no increase in median Alpha score after year thirteen. Six hundred

reformatory inmates, young men between sixteen and thirty, register a median equivalent mental age of thirteen years in Alpha. In the army group, in the state prison group, in the state reformatory group, and in the public school and juvenile delinquent groups after thirteen years of age, there is no significant correlation between increase of Alpha score and increase of age.

These facts induce the hypothesis that the average mental age level of native white adults is approximately thirteen years. No attempt is made to determine the life age limit of mental age growth of individuals. It is necessary to make a distinction between mental age level and total intellect. It is improbable that mental development as a whole is complete at thirteen years, either for individuals or on the average. Emotional development, maturity, skill, acquisitions, aptitudes, and the like probably continue to develop indefinitely.

Clinical psychology is obliged to revise its differentiating mental age standards. It is doubtful if sixteen years should be used as the upper life age limit in calculating intelligence quotients. The upper mental age limit of feeble-mindedness is not coincident with the lower mental age limit of normality.

Allowance must be made for nationality and color in employing mental age for mental diagnosis. Hence the contention that "all who test below mental age twelve or I. Q. 70 are feeble-minded" is seen as a fallacy both logical and experimental. Recent experiences and new data indicate a necessity for extending the concept of a borderline zone of feeble-mindedness to cover a range from mental age seven to mental age thirteen. The application of mental age as a differentiating criterion of mental defect and mental subnormality is specifically limited in the clinical mental diagnosis of persons over ten years of age.

Measurement of Intelligence in Schools for the Blind. S. P. HAYES, Mount Holyoke College.

It has been found possible to use the Binet tests in measuring the intelligence of the blind, only minor changes in the tests being necessitated by the lack of vision. About 1,000 pupils with varying deficiencies in vision have now been tested. The curve of distribution of intelligence quotients takes the normal form, though the per cent. of low-grade pupils is much too high.

A modification of the Pressey group point scale has also been used in three schools for the blind and the results show a similar

distribution to that obtained by the Binet test, and a high correlation with the Binet scores and with estimates of ability by the teachers.

Plans have been made for a mental survey of eight schools for the blind in the east this winter, in which extended tests of attainment in school subjects will be given along with tests of intelligence.

Three-Dimension Models for Symbolizing Abilities J. B. MINER, Carnegie Institute of Technology.

A method for representing individual differences in abilities is suggested. It permits of symbolizing the proportional combination of tested abilities to be found in a complex ability. The model for representing an ability, say salesmanship, as distributed among different individuals within society is to be distinguished from the model representing that ability within one individual. The purpose is to supplement the usual representation of the relations of abilities through frequency surfaces, correlation tables or surfaces. It utilizes a third dimension for relations not now taken care of which are measurable in terms of multiple regression equations, etc. By models and diagrams some possibilities of this method are shown in order to stimulate further thought in this field.

The Evaluation of School Attainment in Terms of Mental Ability. R. PINTNER, Ohio State University.

So far little has been done to coördinate mental and educational tests, and use them for a more accurate diagnosis of the school child. A mental test alone is not sufficient to place a child accurately. We need a measure of his school attainment, and the norms for school work should be based upon age as well as grade. Concretely the problem is: given a child of a certain age and a known mentality, what ought to be his attainment in the ordinary school subjects. The writer has devised two survey tests, one mental and the other educational, to be used together for this purpose.

The standardization is based only upon the children who have taken both tests, and is an age standardization. So far over 1,500 cases have been tested. Because the difference between two percentiles varies greatly in amount at different parts of a distribution, all percentiles have been converted into a so-called index which is equivalent to the sigma value of the percentage rating.

These indices range from zero to one hundred, and have been chosen instead of the sigma values themselves in order to make the procedure simpler for general use in the schools.

Differences between indices are now comparable at any part of the distribution and it is these differences that are significant. In a survey of a school system the median indices, mental and educational, serve as a measure for the school. If the difference between these two indices is small, then the school is accomplishing what can be legitimately demanded of it, and this regardless of the fact that the indices themselves may be high or low. A high mental along with a high educational index indicates children of good mentality accomplishing school work worthy of their capacity. A low mental with a low educational index indicates children of poor mental caliber accomplishing what is suited to their ability. A difference between the indices of more than ten points would seem to denote abnormal conditions. A high negative difference (educational minus mental) indicates good mentality accomplishing poor work and raises the question of the efficiency of the teachers, methods and administration. A high positive difference indicates that the school is accomplishing better results than are ordinarily obtained with children of its mental caliber.

In the same way we may analyse and compare different classes in the same school and also different children in the same class. A better understanding of the educational needs of the child can be made by this combined educational and mental measurement than by a mental test alone. It shows up at once the children of good mentality who are doing school work below their capacity, even although it may be excellent work for the grade they happen to be in. These measurements bring into prominent relief the fallacy of expecting children of different mental ability to do the same educational work, and at the same time suggest where and how a better adjustment is to be made.

Some Recent Work in Mental Tests for College Students. L. L. THURSTONE, Carnegie Institute of Technology.

The Society for the Promotion of Engineering Education is conducting a coöperative investigation of intelligence tests and other objective tests as possible criteria of admission. Six tests have been given to about ten thousand freshmen in forty-seven coöperating colleges. The Pennsylvania State Educational Association is also trying our intelligence examination in thirty-

seven coöperating colleges and normal schools within the state of Pennsylvania. Several other large colleges are giving these intelligence examinations to their entire freshman classes.

At Carnegie Institute we have experimented with about fifty different intelligence tests during the last five years in order to ascertain the diagnostic value of each test as determined by student scholarship and pooled faculty opinion. Some of our mental test work is labeled *service* and the rest of it is labeled *research*. For several reasons we find it essential to keep these two objectives quite distinct. Mental test service at the Carnegie Institute was first in the form of advice to the faculty committees on scholarship of delinquent students. Later it developed that we could be of service in advising the deans about the admission of mature students to professional and vocational courses who did not happen to satisfy the regular entrance requirements. We have been fortunate in that the students so admitted have been retained with good scholastic standing and this in turn has increased the confidence in intelligence examinations on the part of the faculties and administrative officials of the institute. The next step toward official recognition was made when we were requested to give an intelligence examination to every day student of the institute. Now that the results have been further verified it has been decided by the committee on admissions that every student who takes any entrance examination either in June or September in Pittsburgh or in any other locality will also be required to take an intelligence examination. This intelligence examination is prepared by the division of psychology and is so arranged that it can be sent to the high-school principal who conducts the other entrance examinations. This does not apply to the applicants who enter by certificate and who do not take any entrance examinations. It applies only to those who are required to take some entrance examinations in which case a compulsory intelligence test is added. The intelligence test that we use for the purpose just outlined is our Psychological Examination, Test IV, which is a sixteen-page pamphlet in the cycle-omnibus form.

Ability in Mental Tests in Relation to Reading Ability. L. W. WEBB, Northwestern University.

This study is an endeavor to discover the significance one's reading ability has in relation to one's general intelligence such as is employed when taking a group intelligence test.

The subjects in this study were ninety students in one of the writer's classes in psychology. Men and women were in about equal proportion in the group. The Alpha Test was first given to the class; about two weeks later two tests devised by Thurstone, called A and B were used; these were given on succeeding days. A week later the Monroe Silent Reading Test for High-School Students was used; the time was 3½ minutes instead of the usual 5. This test has a score for both rate and comprehension.

The correlation values by the Pearson method were computed for rate of reading and the three tests; this was also done for the combined score of A and B. The values were worked out for comprehension. The correlation between rate and comprehension in reading is .85. This indicates that for our purpose rapidity of comprehension is the more important consideration. For rate of reading the values range from .47 to .59 while the same values for comprehension range from .48 to .69.

We believe that we are justified in making the following conclusion from the above data. Rapidity of comprehension in reading is one of the large factors in determining the grade one makes in a pencil and paper group intelligence test. The fairly high positive correlation values existing in this relation and the consistency with which they occur support this conclusion.

One or two additional suggestions are made. The premium on rapidity of comprehension in our intelligence tests may be one of the significant causes of low correlations so often reported between intelligence tests and scholarship grades. This needs further study. A difficult reading test might be of value in intelligence testing. Our schools should do a better task in teaching rapidity of comprehension in reading, recognizing that this ability is probably limited by the student's intellectual capacity.

Superior I. Q. in Mental Breakdown. F. L. WELLS, McLean Hospital.

Median I. Q. (adult) in 102 consecutive Stanford scale examinations of McLean Hospital patients is 88. This is entirely compatible with normal self-maintenance. I. Q. over 100 is frequent, and as high as 119 has been observed in adults conspicuously incapable of self-maintenance. Only in the organic psychoses does the breakdown regularly involve the ideational capacities with which the intelligence scales are concerned. Normal and superior "intelligence" is very generally associated with grave judgment and

conduct disorder. Above a necessary minimum, the value of intelligence for general adaptation depends greatly upon the support of other factors in the personality, somewhat as a boxer's technical skill must be supported by courage and physique. Intelligence scales measure essentially ability to deal with *ideas*, as distinct from ability to deal with *things*, or with other *persons*. Psychotic breakdowns are essentially failures of adjustment to the social environment. The present experience emphasizes the minor rôle of "intelligence" (ideational capacity) in mental balance, and supports the conception of education as a discipline of character rather than of knowledge.

A Study of the Intelligence of 250 Delinquent Girls. E. L. Woods, Wisconsin State Department of Public Instruction.

This paper presents the results of a study of 250 delinquent girls in the Wisconsin Industrial School for Girls, by means of group and of individual tests.

Certain facts of training, of heredity and of home and social conditions were also ascertained in an attempt to see what, if any, correlation there might be between: (1) test results and amount of schooling; (2) test results and normal versus abnormal home conditions.

The group tests used were the recently devised Virginia tests Alpha 1. These have been used on several thousand school children in typical cities of the United States and age and grade norms established. The individuals showing marked variation from the average of the group were also tested with the Binet scale.

The charts will show: 1. A comparison by school grades between the delinquent group and an unselected group of school children in group test achievement; 2. A comparison by ages between the delinquent group and the unselected group in group test achievement; 3. The relation between amount of school training and accomplishment on the group tests both for the delinquent and for the unselected group; 4. The relation of group test achievement to mental maturity as rated by standard individual tests; 5. Correlations between various tests in the Alpha 1 group (as, for example, the Devens literacy, the unfinished pictures, and the like) and mental maturity.

The paper draws certain conclusions with regard to the usefulness of group tests both in institutions for delinquents and in school groups.

Abnormal Psychology

Variations in Mental Equipment not indicated by an Intelligence, Ratio. A. F. Bronner, Judge Baker Foundation.

Earlier psychology tended to emphasize the multiplicity of mental processes, their differentiation from each other and their functioning in simple and complex combinations. Psychologists, it would seem, should be the last to endorse the thesis that by the study of merely a few mental processes or of a few complex activities on the basis of brief group testing or in terms of a numerical rating of "general ability" practical adjustments, educational, vocational, and social, can be satisfactorily made.

Group testing has very specific values; it has also distinct limitations; many of the individual's most important reactions are lost altogether. But also an "intelligence" quotient or coefficient is, in a sense, group testing; if used only in quantitative terms it is a statement of an individual's "ability" as a group-rating. It enables comparative studies of groups and investigation of the make-up of any one group. However, it does not afford opportunity for knowing or stating the variabilities of any one individual in the group. It represents no analytical interpretation, no adequate study of the individual himself.

The function of clinical psychology is largely that of individual diagnosis, inevitably involving the problems of individual adjustments. The solution of these problems cannot be revealed by a numerical figure, or by a general statement of an individual's rating in a group even in terms of his variation from a central tendency that may have been established for his age, sex and social group. Solutions involve intensive and accurate study of abilities and disabilities as they are related to the problem at hand.

Extremely varied special problems are presented to the clinical psychologist; these require special study by means of special tests, unless we hold the brief that there is such a high correlation between all mental abilities that the findings on any test or set of tests are therefore valid for all mental processes.

The criterion of the value of a test is not its correlation with an I. Q. or some other test or system of tests. The criterion is the reliability of the test itself and its practical value as diagnostic of abilities required in practical accomplishment.

The analysis and interpretation of test findings is the second great requirement of the clinical psychologist. Illustrative problems and findings are included.

Hemi-Hypertrophy in Relation to Mental Defect. A. GESELL, Yale University.

Hemi-hypertrophy is a rare but a significant anomaly of development. It is a congenital abnormality which consists in a unilateral overgrowth of one half of the body.

The paper includes: a description of a moron exhibiting this abnormality, studied by the author in 1914 and in 1919, a review of the medical literature and an analysis of the cases to discover the relation of hemi-hypertrophy to mental deficiency, a discussion of possible relations to twinning, physiological age, cranial asymmetry, cerebral sclerosis, and hypertrophic amentia, and the clinical significance of physical asymmetry.

The Psychology of Functional Neuroses. H. L. HOLLINGWORTH, Columbia University.

The psychoneurotic picture is essentially that of a redintegrative reaction,—a portion of an original stimulus or situation redintegrates the total response previously given to the original situation. The redintegrative reaction, however, is common also to normal perception, to infantile thinking and to primitive magic, and the psychoneurotic make-up must be distinguished from these conditions. The distinction is to be made on the basis of *sagacity*, which along with *learning*, constitute intelligence. Sagacity consists in the ability to single out the significant detail, instead of reacting to any chance item. Redintegration may take place on a cortical level, in which case it constitutes ordinary understanding, thought, or perception of meaning, and is a normal process. Or it may take place on a postural level, in which case the picture of conversion hysteria results. Or it may take place on the autonomic level, thus giving rise to the anxiety neurosis. If cortical redintegration takes place, the postural and autonomic responses may be determined by the total pattern and are not redintegrative. Cortical immaturity or weakness would mean greater redintegrative predisposition on the other two levels. Since the postural level is more closely connected with the cortical level than is the autonomic, intellectual inferiority would predispose one more definitely toward conversion hysteria than toward the anxiety type. Measurement of psychoneurotic soldiers shows that not only are they in general intellectually inferior, but also that the conversion forms represent a lower intelligence level than do the anxiety forms. A measurement of the influence of motivation is also presented.

Most of the "mechanisms" of psychoanalysis are reducible to the concept of redintegrative response, as are also various other notions of hysteria.

The Psychological Detection of Syphilis. F. MATEER, Bureau of Juvenile Research.

This is merely a brief attempt to demonstrate the possibilities of present-day clinical psychology when the accepted methods are used for the analysis of qualitative and functional indications instead of serving merely the discovery of a mental level. In the Bureau the ascertainment of mental age is merely a preliminary, although a necessary, step in the diagnosis of a case. Mental age and I. Q. are not sufficient data upon which to base diagnoses but need qualitative interpretation.

Our study so far shows three things which give significant contributions to the knowledge of a case from its functional or qualitative side. These are: (1) The range of distribution of pluses and minuses from highest ability to lowest failure, (2) The relative distribution of successes and failures, (3) The quality of each response, be it creditable or not. It is the use of these three criteria which differentiates the psychopathic individual from the non-psychopathic, be he of normal mental age, a moron, idiot or genius, so-called. In the past year's work our attempts at qualitative analysis have led us farther. They have shown us the differentiation of various groups of psychopaths. One of these groups, with a typical distribution, is that of the syphilitic, be he congenital or primary in type. To a surprising degree this distribution seems to be pathognomonic. For seven months we have been testing out these findings and re-evaluating former cases in the light of them. Data are available on over seventy syphilitics, representing about twenty per cent. of the cases which have been studied intensively from the psychological and medical laboratories.

The syphilitic distribution shows that syphilis is a selective agent and its selection means a definite reduction of certain test functions. These are distinctive enough to render possible a diagnosis of syphilis before laboratory findings are available. Even when he tests at a feeble-minded level the syphilitic is a psychopathic deteriorate. He looks like a feeble-minded person but he is different. The psychopathy may be modified by the low level of deterioration. The congenital syphilitic becomes delinquent in a larger per cent. of the cases than the non-syphilitic of similar

mental level. His delinquencies form a syndrome as distinct and pathognomonic as his distribution on tests.

The Clinical Psychologist. D. MITCHELL, Pelman Institute.

Clinical psychology deals with individuals but it may follow group experimentation and classification. Diagnosis, prognosis, and therapeutic treatment are the main features.

Clinical psychology is not synonymous with applied psychology, nor is the field of clinical psychology coterminous with the field of applied psychology. Psychology may be applied in the fields of advertising, salesmanship, or law, but in those fields it may have no relation to an individual, whereas in the clinical field individual examination, diagnosis, and prescription are the chief functions.

The psychology of the laboratory is frequently individual but its aim is different. The determinations of standards of present position, of rate of learning, of differences in groups, and so on, are made frequently by individual laboratory experimentation but it is with the notion of developing scientific knowledge rather than helping the subjects.

In other words, the psychology of the laboratory is a science while clinical psychology is a professional practice. Among the problems with which it may deal are; the determination of mental status in order to prescribe kinds and methods of education, the ascertainment of specific abilities or disabilities which may be aids or handicaps in following some particular vocation, and the emotional and instinctive factors which may militate against, or assist in the development of desirable social reactions.

The Phenomena and Mechanisms of Mental Conflicts involving Subconscious Processes. M. PRINCE, Boston, Mass.

Mental conflicts as interpretations of behavior are ordinarily inferred from known mental antecedents. Further, generally one, at least, of the conflicting factors has to be inferred as a subconscious process. The resulting behavior becomes an interpretation of the inferred conflict.

By certain technical methods of dissociating the mind and by observation in cases where the mind has been already associated, the conflicting factors, the precise conflict and the resulting phenomena can be determined by direct evidence. The phenomena thus becomes subject to experimental investigation.

In this paper conflicts are studied by this method. The ob-

served results are given as examples of different types of conflict, with the evidence for the precise character of the subconscious factor thus determined.

General conclusions: Conflicts are normal processes belonging to mental mechanisms; any two (or more) antagonistic "sentiments," motivated by the impulsive forces of their emotions, may come in conflict and the stronger inhibit, or repress the other, or otherwise produce "defense" phenomena of various sorts; one may be subconscious, or both may be subconscious.

Any of the primary or compound emotional innate systems, or any of the instincts, or innate impulses belonging to personality (fear, anger, curiosity, sex, love, repugnance, jealousy, hatred, etc.) may provide the motive force.

The conflict may involve large systems of the mind and then results in gross alteration of personality.

On the Systematic Expansion of Terminology for Mental Symptoms and Processes. E. E. SOUTHARD, Psychopathic Hospital, Boston.

The suffix *-ia* is proposed for symptoms, *-is* for processes. The prototheme contains the modifier, the deuterotheme the quality of mind under discussion, in terms for symptoms. In terms for processes the prototheme contains the quality of mind under discussion and the deuterotheme contains the modifier. E.g. *schizophrenia*, the symptom; *phrenoschisis*, the process. Tables of terms are presented.

EDUCATIONAL AND COMPARATIVE PSYCHOLOGY

The Correlation between Interests and Abilities in College Courses. J. W. BRIDGES, Ohio State University.

Previous studies of this subject have been based upon subjective estimates of both interests and abilities; and correlations as high as .89 have been obtained. This is no doubt much higher than the actual correlation; for judgments of interest and of ability cannot be made independently of each other. A more valid result would be obtained, if objective measurements of ability were used. Such measurements seem to be afforded by college grades, especially when the proportions of the various grades assigned conform approximately to the normal distribution.

To try out this method, about five hundred students were

requested at the beginning of the semester to arrange their courses in order of interest, and also in order of their ability in them. At the end of the semester the grades in these courses were obtained; and correlations between these grades and order of interest, as well as between order of interest and estimated order of ability were determined.

Pearson's coefficient of mean square contingency was used, as it seemed to be best adapted to this rough form of evaluation of traits. Coefficients were calculated for boys and for girls, for each college year, for all courses combined, and for certain courses taken separately. The coefficients for interest and ability as measured by grades range from .25 to .28, while those for interest and ability as estimated range from .50 to .59. The latter high correlations and those of previous studies are thus in large part due to the subjective method of evaluating ability; and it is likely that the actual relationship of interest and ability is more accurately represented by the smaller figures.

There are, however, many obvious objections to the use of college grades as measures of ability. Among others are: (1) College grade is also in part dependent upon interest. The effect of this would be to increase the correlation. (2) College grades are not sufficiently discriminative; and consequently many students get the same grade in all their courses when their actual abilities are perhaps not so even. The effect of this would be to decrease the correlation. It is difficult to say how far these two factors counteract each other.

Psychological Tests in the Training of Teachers. E. A. KIRKPATRICK, Fitchburg State Normal School.

Present-day conditions justify normal schools in giving their students some knowledge of psychological tests and of their uses in education, but it is an open question as to how much time should be devoted to training students to give tests. Experiments of the writer indicate that ten to fifteen hours training in giving the Binet Tests prepares most students for using the tests as an aid in the proper classification of children. Students can be trained in giving group tests in a much shorter time, but if they are also trained to score, tabulate and interpret the results of several kinds of group intelligence tests the time required is considerable.

Results Obtained from Children in the First Three Grades, by Means of a Group Scale of Intelligence. L. C. PRESSEY, Indiana University.

It is pointed out that a group scale applicable to children in the first three grades contributes unique material for the study of many psychological and educational problems, since (*a*) results obtained from children soon after they begin school are free from any possible influences of school training or other related factors, (*b*) entering classes are groups as yet unaffected by such selective influences as school retardation and elimination, and (*c*) extensive data from such young children should have great value in contributing to the study of mental development.

As evidence for these contentions three brief studies are presented. In each instance, the material presented is part of a of a complete survey covering all the children in school, from the first grade through high school, in the communities studied; the writer's scale was used in the first three grades, and a variety of tests of intelligence with the older children. And in each instance comparison is made between results obtained from the upper grades and results obtained from the six and seven year old children, with reference to the factors mentioned above. (1) Results from a poor country district, having six month schools and poorly trained teachers, are presented, to determine the extent to which inadequate schooling may influence results from the upper grades—the "Primer" scale giving a check on this factor. (2) Children of professional men are compared with children of day laborers, to determine whether the greater school retardation and greater elimination among children of the poorer classes may not play a part in the findings, if such a comparison is made on the basis of results from children in the upper grades only; again the writer's scale is used as a check. (3) A comparison is made of the relative standing of colored and white children six and seven years old, and colored and white children twelve and thirteen years old, to investigate whether there may be a more rapid early development among colored children and so a greater similarity of the races at the earlier ages.

It is urged that group tests of intelligence applicable to children in the first three grades may contribute data of great value to the study of many such problems, and that such data may be essential, in not a few such instances, to an adequate understanding of the situation.

A Study of Factors other than General Intelligence Important for the Prognosis of School Success. S. L. PRESSEY, Indiana University.

The paper is a report of first findings in an extensive study attempting analysis of the factors which contribute to success or failure in junior high school. The data include school marks, systematised teacher's estimates (not only of general ability, but also of specific abilities, and of such factors as general health and school attitude), the results of a large number of tests of general intelligence, and also findings with standard tests of achievement in arithmetic, spelling, geography, and other special subjects.

The preliminary analysis emphasized (1) previous preparation and (2) character traits, such as persistence, conscientiousness, application, as very important factors, measurements of which were desirable for the prognosis of school success. An effort is, therefore, made to obtain measures of these two factors which may be of value for purposes of prognosis.

1. It is suggested that we need to know more of the prognostic, as distinct from the supervisory and the pedagogic significance of data obtained with the "standard" educational tests. An attempt is, therefore, made to evaluate certain of these tests: the method of partial correlation is used, and an indication as to the interrelation of these abilities, and an appraisal of the independent value of each test as a means of forecasting school progress, are sought.

2. A scale designed to measure emotional control is presented, with data as to its validity from the twenty best and twenty worst children, from the point of view of discipline, in a large junior high school, from a similar double group of high-school children, from a university class in experimental psychology, from a group of girls at the State Industrial School, and from a group of cases from a State Hospital for the Insane. It is argued that the group test method has exceptional advantages for the investigation of such complex problems, since a large number of cases can be examined, and type reactions obtained. Suggestions with regard to further tests are offered.

Concerning the Influence of Education and Environment on the Religious Ideas and Beliefs of Children. W. F. SHEPHERD, Washington, D. C.

The purpose of the study was to determine the importance of

the above factors in moulding the ideas and beliefs of children as to the more important objects and conceptions of religion. The questionnaire method was employed, supplemented by cross-questions. The subjects were of different classes and denominations. 148 children were studied, ages 8 to 13 years.

The writer concludes: (1) Education has been a very important factor; (2) Social environment has been an influence; (3) Children's confidence in others has been a very important factor; (4) Authority has been concerned; (5) Thought has been concerned; (6) The confidence shown has been like that of primitive man in gaining his religious ideas; (7) The writer believes that these conclusions apply to greater or less extent to the religious ideas and beliefs of children of other ages than eight to thirteen years.

The Combined Use of Mental and Educational Tests Illustrated in the Case of Language. D. STARCH, University of Wisconsin.

This investigation attempts to show the use of mental tests in the interpretation of the results of educational tests. A series of mental tests and a series of language tests were given to about one thousand first-year pupils in twelve high schools. The results show large group differences in language abilities accompanied by little or no difference in general mental ability.

The Need for Analytical Study of the Maze Problem. J. F. DASHIELL, University of North Carolina.

The maze method of studying the process of learning, in both human and animal psychology, has shown little analytical attention given to the exact forms of mazes used. This introduces uncontrolled factors that may render comparisons between one maze learning process and another unreliable. It follows that an intensive study of just what rôle each element in a labyrinth plays in the whole complex should yield results of value.

As a sample of how this can be approached an experiment is reported upon white rats with mazes built upon a multiple unit system. Criticism of a point in Watson's *Behavior* is used as a point of departure, and a study made of the questions: (*a*) Is the probability of an animal's passing into a straight-ahead pathway the same as that of its turning into one at the side? (*b*) Again, upon its exit from a blind alley is it as likely to reënter the old path as to enter upon the new one? (*c*) Finally, does the position of this blind alley with reference to the true path affect the direction taken

upon exit from it? Fifty rats were used on ten different mazes, five to each. Records of entrances and exits at blind alleys led to the conclusions: (1) A blind alley opening straight ahead is more likely to be entered than to be passed, in about the ratio of 5 to 3. (2) A blind alley opening at the side is about as likely to be entered as to be passed. (3) The exit from a blind alley opening straight ahead is more likely to be in the forward than in the reverse or backward direction, in about the ratio of 3 to 2. (4) The exit from a blind alley opening at the side is more likely to be in the forward than in the reverse direction, in about the ratio of $3\frac{1}{2}$ to 1.

Some other problems arising in the analysis of the maze experiment are suggested.

Integration of Movements in the White Rat in the Maze. J. L. ULRICH, Johns Hopkins University.

In the investigation of learning in the maze, the reflex extension and flexion of the rat's limbs were discovered to be of great importance. Passively moving the head of a well-developed rat to the left or to the right evokes movements of the limbs in the manner of rhythmic progression, and dorsally extending the head or the tail produces posture of the limbs and of the body for jumping. The extensor thrusts of the fore limbs are the most important in learning. In rats a predominant right extensor fore thrust is more often evoked than a left. Excitations from the labyrinth of the ear, from the sense organs in the skin, muscles, and tendons evoke the extensor thrusts.

When the reflex extensor thrusts of the limbs were well developed, direct progression in the Watson maze was soon acquired. On the fourth or the fifth trial progression through consecutive alleys and turns occurred and was continued for many trials. With rats possessing a predominant right fore extensor thrust, progression to the left through acute turns 1 and 3 was difficult, but progression to the right through acute turns 2 and 4 was easy; the reverse was the rule with rats with a predominant left extensor thrust. With two square mazes on the plan of the Watson maze, necessitating in one, progression to the right through acute turns 1 and 3, and in the other maze, progression through obtuse turns 1 and 3, the same results were obtained. In another maze in which progression could be to the right through acute turns, or to the left through obtuse turns, progression was with rats with a predominant right reflex thrust to the left through obtuse turns, and

with rats with a left extensor thrust it was to the right through acute turns. Retracing of steps and stops occurred in alleys leading to or from the difficult turns. Fluctuations in the reflex extensor thrusts with the appearance or disappearance of any thrust conditioned the production of so-called errors, and progression through different sets of turns was reversed or was irregular. Stability of the thrusts in a great measure conditioned "retention" or redintegration. Learning, then, is conditioned by reflex mechanisms and not by sensory motor connections or "sensory impressions."

Social and Applied Psychology

Behavior and Experiment in Social Psychology. F. H. Allport, Harvard University.

It is our purpose to present a brief program for the observation of social behavior and the experimental analysis of social response. Social psychology, we may say, studies responses which are conditioned in whole or in part by the social environment. These responses are either (1) *caused* by social stimuli, or (2) *influenced* by social stimuli.

A social stimulus may be defined as the stimulation resulting from some movement, sound, gesture, or attitude of another individual of the same or somewhat closely related species. Social and individual psychology, from the genetic viewpoint, show a close interpenetration through gesture, language and thought. In practice however it is possible to separate them by distinguishing between social and non-social stimuli.

The direct response to a social stimulus occurs at least as low in the animal scale as the arthropoda. It achieves great importance in the behavior of primates, giving rise to responses which might be termed "social intelligence." This type of action Prof. G. H. Mead has effectively characterized as a "conversation of attitudes."

The response influenced by a social stimulus has been experimentally studied by the writer under conditions of co-working, co-feeling, co-thinking, etc. The individual in the group performed the same sort of task that the others were doing, or he experienced the same feeling or suggestion. The results indicate an important set of influences of the group upon the general attitude of the subject toward his task. There are to be noted (1) a facilitation of movement, (2) a compulsion toward haste at the expense of quality, (3) an objective direction of attention, (4) experiences of rivalry,

and (5) an important attitude toward social conservatism in the returning of judgments.

The direct response to social stimulus means the assumption of an attitude or disposition toward reaction of a given type; the response influenced by social stimuli is evinced by a modification of the subjects general attitude. Progress in social psychology as an empirical science demands observations and experimental analysis of both these forms of influence of the group. To understand the *crowd* we must first learn the social behavior of the *individual.*

The Psychology of the "Sense" of Unutterable Revelation. J. H. LEUBA, Bryn Mawr College.

Among the once mysterious psychological phenomena that have exerted and still exert a far-reaching influence, particularly in religious life, few are as interesting to the psychological student of religion as the conviction or "sense" of unutterable revelation which at times follows upon certain states of unconsciousness.

The paper consists of an analysis of instances of that curious phenomenon and of an explanation of it. In that explanation it was not found necessary to have recourse to subconscious, or co-conscious mental processes, and still less to superhuman agents such as were suggested by Wm. James.

Psychological Tests of Aviators used in the A. E. F. F. C. DOCKERAY & S. ISAACS.

Medical aviation in England, France and Italy, as well as in the United States, has recognized psychological aspects and methods in the selection and subsequent testing of pilots as distinct from the more purely medical and psychiatric. A variety of tests and methods have been developed in the several countries, Italian and French psychologists stressing simple reaction-time and bodily reactions to "emotional" stimuli, and the English, motor coördination. Italy, perhaps more than any of the other countries, has installed psychological tests in the routine examination of aviation candidates, and engaged in research along these lines. Thus, at the psycho-physical laboratory at Turin of the 2,702 candidates (30.7 per cent.) rejected out of 8,799 examined in 1918, 7.1 per cent. were disqualified on "excessive emotional reaction," and 6.3 per cent. on "long reaction-time," 2.2 per cent. and 1.9 per cent. respectively of the total number examined. The writers, as members of the Psychology Department of the Air Service Medical Research

Laboratory in the A. E. F., used the method of the French in applying simple reaction-time tests to American chasse pilots returned from service on the front, and to moniteurs instructing at the 3rd Aviation Instruction Center, A. E. F. These results were correlated with the findings of the Medical Department of the Laboratory, and with the rating in aviation ability by the Training Department of the flying field. A definite tendency to correlation of aviation ability, and fitness found by the Medical Department, with auditory reaction-times, and the coefficient of variation, considered by the French as an index of stabilty or emotional control, was indicated. Tests of control of involuntary movements, regarded as important by the English, were likewise applied to the same groups. A high and reliable coefficient of correlation was obtained between degree of tremor in the steadiness test and aviation ability. A test of aërial observers in observing and reporting was also used. The discriminative recognition reaction-time was decidedly better in the group of observers rated as good in their performance at the front than in the group rated as poor or indifferent.

A Study of Ocular Functions with Special Reference to the Look-Out and Signal Service of the Navy. C. E. FERREE & G. RAND, Bryn Mawr College.

The incentive for this work was the need for establishing a system of testing for those branches of service in the Navy requiring especially keen scotopic acuity. The first step towards the accomplishment of this purpose was the devising of a suitable apparatus and test method. A further need was to find out what range of difference in scotopic acuity might be expected among eyes graded as fit on the basis of the tests of other functions and capacities. A consideration of this need has led us to make a preliminary survey of eyes graded as normal with regard to photopic acuity and other commonly tested functions in order to determine whether such eyes may be expected to show a significant difference in keenness of functioning at low illuminations.

In a thorough test for vocations requiring keenness of discrimination at low illuminations, the following points should be taken into account: (1) the minimum amount of light required to discriminate the test-object before dark adaptation; (2) the minimum amount after a properly selected period of dark adaptation; and (3) the rapidity as well as the amount of gain in acuity in the process of adapting. Determinations covering all of these points have been made in this study.

Results have been obtained also showing the sensitivity of the illumination scale for determining the exact amount and placement of the correction of astigmatisms. In securing these results cases with and without a cycloplegic have been employed. The usefulness of the test method for detecting irregular astigmatisms has also been demonstrated.

What Industry Wants and Does not Want from Psychology. E. FROST, Rochester Chamber of Commerce.

In making suggestions for the application of the principles of psychology, it is assumed that the psychologist is now freely and fully committed to the application of psychology where such application can be of genuine service.

At the present moment the needs of industry are conspicuously great. Their satisfaction, however, is complicated not by the poverty but rather the multiplicity of alleged panaceas, most of which, valuable as they are, represent only a partial and therefore an inadequate remedy.

Industry must make money to live and consequently psychology in assisting industry must expect to have its value questioned in terms of money return. This is notoriously difficult to demonstrate of any intangibles.

The broad problems facing industry to-day are:— (*a*) Unionism and shop committees, (*b*) wage and hour adjustments, (*c*) labor turn-over, (*d*) americanization, (*e*) avoidance of wastage, (*f*) better housing and conditions of workers, (*g*) taxation, and in some states the further problems of, (*h*) compulsory health insurance, (*i*) continuation schools.

The problem of workingmen's compensation and of industrial safety has been rather generally and successfully met.

Four of these problems offer possible opportunities for the psychologist. Psychology can help in reducing *labor turn-over* if it can devise a simple test for intelligence, temperament, and adaptability to a particular task. It can assist in *americanization* by programming a wise education for the foreigner and illiterate, both in English and American ideals. It can make specific tests, in the third place, of the problems faced by the *shop foreman*, both as to the management of labor and in the conduct of the vestibule or training school, and finally, it can in many states, contribute to the effectiveness of *continuation schools* where theoretical instruction is given during the periods of the working day.

Industry is not at the present time agreed upon the commercial value of so-called army intelligence tests, even granting their competency to detect intelligence or the lack of it. Industry suspects the conclusions drawn from a knowledge of mental ratings since it suspects that many factors of significance in determining efficiency are not analyzed out by any examinations thus far devised.

Psychology can always offer help to industry here and there but if it is to do so generally and with success, it must dissect the problems of industry with care and apply specific remedies rather than generalizations.

Recent Developments in Trade-Test Theory. A. KORNHAUSER & B. RUML, The Scott Company.

Recent developments in trade test theory are a departure from two particular features of the army method. (1) The army oral trade test was a fixed list of questions with norms established for the total list, very much as there are set norms for an arithmetic scale or an opposite test taken as a whole. (2) The army trade test made use, as do almost all mental tests, of the wrong regression line in predicting ability from test score.

A method has been developed which uses the proper regression relation and which treats individual questions as standardized units. From a practical point of view, this makes the test flexible as to questions included and excluded in a particular examination. Hence, (1) a test may be made as brief as desired. (2) It may be varied at will to prevent coaching and to meet unusual circumstances. (3) In testing, it is unnecessary to give questions less difficult than those already passed or more difficult than those already failed. (4) The test may be continually developed by the incorporation of new questions standardized in connection with the use of existing questions (5) Questions proving undesirable may be dropped without necessitating restandardization or change of norms.

The treatment of each question makes use of the relation of trade ability to score. The army method used the reverse relation —the average score for each grade of trade ability. Obviously, however, our diagnosis must proceed from score to trade status, not from trade status to score.

In using the regression of trade status on score, the new method does not consider simply the average (or most probable) trade status for a given score, but expresses the actual numerical chance

that a man making a particular score on the individual question is a novice, apprentice, journeymen or expert.

With these probabilities as a criterion, the questions are classified into three levels—apprentice, journeyman and expert—analogous in some respects with Binet year levels. There are several important differences, however, in addition to the use of the new regression relation and the employment of probabilities. (1) Questions are placed at the level where they differentiate best, not where a certain percent have passed. (2) Questions are weighted in proportion to their differentiating value. (3) Questions are weighted differently if passed and if failed.

Applications of this method of determining the value of test elements, placing them and assigning weights by means of probabilities are suggested for several types of mental tests.

The Extension of Rating Scale Theory and Technique. D. G. PATERSON & B. RUML, The Scott Company.

Standardized subjective measurements of ability are made by means of the so-called "Rating Scale." The objection that you cannot combine measures of disparate qualities such as "leadership," "coöperativeness," etc., into a single quantitative expression is evidence of faulty logic. Such an objection is usually argued by analogy to the impossibility of adding two apples, four oranges and six pears. The rating scale is not such an adding device. On the contrary, it secures a numerical measure of disparate qualities each of which is correlated with general value in a particular line of work. The measures then are measures of varying reliability of the individual's general value. These several measures, each inferentially diagnostic of general value, can logically be summated.

The type of rating scale here considered marks a distinct advance in principles of construction over the rating scales we are familiar with. Each element is a definition of one type of activity carried on or of one type of result achieved by those being rated. It is more objective and involves less of an attempt to measure intangible elements of personalities. A contrasting example of the newer and the older type of definition is as follows:

Older definition: "Leadership: Judge initiative, force, self-reliance, decisiveness, tact, ability to inspire men and to command their obedience, loyalty and coöperation."

Newer definition "Leadership: Judge his ability to develop

a loyal and effective organization by administering justice, inspiring confidence and winning the coöperation of his subordinates."

In using the "Man to Man" comparison type of rating scale, we find it essential to demand extensive experimental ratings from small groups of executives in order that the "Master Scales" may be properly calibrated. The probable error of the ratings of one judge compared to the ratings given the same employees by other competent judges is determined. Tendencies to rate too high or too low are corrected by indicating the precise type of revision of the "Master Scales."

The rating scale in industry is a valuable educational tool. The analysis of work into fundamental elements leads the executives to think more analytically with regard to essentials. It also encourages a more introspective attitude on the part of those subject to the operation of the rating scale.

The rating scale needs careful analytic work and follow up in order properly to safeguard the rights of those being rated by superiors.

An Important Constant Error in Psychological Rating. E. L. THORNDIKE, Teachers College.

In a study made in 1915 of employees of the General Electric Company and the Westinghouse Electirc Company, it appeared that the estimates of the same man in a number of different traits, such as intelligence, industry, technical skill, reliability, etc., were very highly correlated and very evenly correlated, much more so, than general observations of human nature would lead one to expect. It consequently appears probable that those giving the ratings were unable to analyze out these different aspects of the person's nature and achievement and rate each in independence of the others. Their ratings were apparently affected by a marked tendency to think of the person in general as rather good or rather inferior and to color the judgments of the separate qualities by this general feeling. This same constant error toward suffusing ratings of special features with a halo belonging to the individual as a whole appeared in the ratings of officers made by their superiors in the army.

Recently Miss Clara Chassell, working on estimates of intellect and various traits of character, has likewise found that correlations of subjective ratings, in spite of the attenuation due to their accidental error, are higher than objective facts make probable and are more uniform than objective facts make probable. The fact

is brought out in almost indisputable form by an investigation made at Teachers College by Mr. Knight with judgements upon intellect, general teaching ability and ability to maintain discipline in the case of teachers.

The writer has become convinced that even a very capable foreman, employer, teacher or department head is unable to treat an individual as a compound of separate qualities and to assign a magnitide to each of these in independence of the others. The magnitude of the constant error of the halo, as we may call it, also seems surprisingly larger, though we lack objective criteria by which to determine its exact size. As a consequence science seems to demand that in all work on ratings for qualities and the like the observer should report *the evidence*, not a rating, and the rating should be given on the evidence to each quality separately without knowledge of the evidence concerning any other quality in the same man.

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NOTES AND NEWS

WE regret to announce the death, on February 8, of Dr. Elmer Ernest Southard, professor of neuropathology in the Harvard Medical School, and medical director of the Boston Psychopathic Hospital. For a number of years Dr. Southard has been the responsible editor for psychopathology on the BULLETIN staff. His scientific contributions have been in the fields of neuropathology, psychiatry, and mental hygiene, and he has contributed much to a psychiatric-psychological rapprochement.

MR. FRANK WATTS has been appointed lecturer in psychology in the University of Manchester.

AT the recent meeting of the American Psychological Association the following officers were elected: President, Dr. Shepherd Ivory Franz, Government Hospital for the Insane; Secretary-Treasurer for three years, Professor Edwin G. Boring, Clark University; Members of Council for three years, Professor H. S. Langfeld, Harvard University, and Professor C. S. Yoakum, Carnegie Institute of Technology.

PROFESSOR RALPH B. PERRY, Harvard University, was elected president of the American Philosophical Association, and Professor Alfred H. Jones, Brown University, was elected secretary at the recent meeting of the Association.

PROFESSOR E. K. STRONG, JR., Carnegie Institute of Technology, has been elected chairman of the newly organized section of psychology of the American Association for the Advancement of Science.

ANNOUNCEMENT is made that the prize of one hundred dollars offered in 1914 for the best paper on the availability of Pearson's formulæ for psychophysics, to be judged by an international committee consisting of Professors W. Brown, E. B. Titchener, and F. M. Urban, has been awarded to Dr. Godfrey H. Thomson, of Armstrong College, Newcastle-upon-Tyne, for an essay entitled "On the Application of Pearson's Methods of Curve-Fitting to the Problems of Psychophysics."